12, 17, and 21, clarifying that the fullerene layer is a fullerene polymer film finds support, *inter alia*, at page 8, lines 6-8. Therefore, no new matter has been added.

All the pending claims are directed to a *method* for making a complex structure that includes at least three elements: a substrate, a carbonaceous thin film, and a fullerene polymer film. In some embodiments, the structure is made by first *forming* the carbonaceous thin film on a smooth surface of the substrate and then *forming* the fullerene polymer film on the thus formed carbonaceous thin film. (Claims 12, 14, 20, 21, and 24-27.) The carbonaceous thin film is formed on the substrate, for example, by thermally decomposing an organic compound. (Claim 27.) In other embodiments, the structure is made by first *forming* a first electrode on the substrate, *forming* a carbonaceous thin film on the surface of the first electrode, *forming* a fullerene polymer film on the thus formed carbonaceous thin film, and then *forming* a second electrode on the thus *formed* fullerene polymer film. (Claims 25 and 26.) Such structures find use, for example, in solar cells. (Appl., col. 3, lines 1 and 2.)

The examiner rejected claims 12-17 and 19-24 under 35 U.S.C. § 103(a) as obvious in light of U.S. Patent No. 5,277,996 (Marchetti *et al.*) taken alone or taken in combination with U.S. Patent No. 4,495,044 (Banks). Reconsideration is respectfully requested. Nothing in these references would have suggested a method for making a complex structure that includes the steps of *first forming* a carbonaceous thin film on a smooth surface and *then forming* the fullerene polymer film on the thus formed carbonaceous thin film.

Marchetti *et al.* describe electrodes for fuel cells. The electrodes are comprised of three layers: a carbon substrate layer 30, a fullerene anchor layer 36, and a platinum catalyst layer 37. Marchetti *et al.* teach:

> "The electrodes are composed of substantially planar adjacent layers. These layers include a carbon substrate layer in physical contact with either the fuel chamber or the oxidant chamber . . . Next, an anchor layer, composed of C_{60} . . . Finally, a platinum layer serving as the catalyst of the reduction/oxidation reaction . . . "

(Col. 3, lines 7-17.)

When incorporated into a fuel cell, the electrodes are placed next to either a fuel chamber 10 or an oxidant chamber 14. Marchetti *et al.* state: "The anode 6 is placed between the

electrolyte matrix and the gas or fuel chamber 10 . . . Cathode 8 placed between the electrolyte matrix 4 and the oxidant chamber . . . " (Col. 4, lines 4-10.)

The fuel cells of Marchetti *et al.* would not have made obvious a method for making a complex structure by first forming a carbonaceous thin film on a smooth surface of a substrate and then forming a fullerene polymer film on the thus formed carbonaceous thin film as recited in claims 12, 14, and 19-24. In Marchetti *et al.*, a multi-layer electrode containing a substrate layer and a fullerene layer is first manufactured and then the electrode is simply placed next to a gas or oxidant chamber.

Consequently, applicants disagree with the examiner's assertion that, "Marchetti discloses a method of making a fuel cell electrode in which a fuel chamber 10 is coated with a substrate layer 30 made of fibrous carbon material (col. 4 lines 52-60) and a fullerene carbon layer 36 (col. 5 lines 8-10) as demonstrated in Figure 2." Chamber 10 is not coated with a substrate layer and then coated with a fullerene carbon layer. Instead, an electrode 6 is first manufactured and placed next to the fuel chamber when the fuel cell is ultimately assembled.

Banks is cited because it discloses diamondlike carbon *flakes* which are produced by the vacuum deposition of carbon on smooth surfaces. Banks teaches that as the deposited carbon thickens, spalling occurs. The spalled flakes are then collected as they fall into a receiving container. (Col. 28-32.) The thus produced flakes are useful as a filler material. (Col. 1, lines 20 and 21.) Consequently, Banks does not disclose and would not have suggested forming carbon films, much less fullerene polymer films, on smooth carbon surfaces. The examiner maintains that:

> "One skilled in the art given the teaching of Banks would realize that the same can be applied to any other process with the expectation of obtaining similar results. Hence, it would have been obvious to utilize a smooth carbon surface as taught in Banks in Marchetti's process with the expectation of obtaining similar results."

However, the similar results that one skilled in the art would expect would be the flaking of the fullerene as it was applied to the substrate layer. Accordingly, one skilled in the art would have no motivation to employ the smooth surface described in Banks in process for manufacturing the electrodes disclosed in Marchetti *et al.*. Therefore, nothing in the references

relied upon by the examiner would have made obvious the method recited in claims 12, 14, 20, 21, 24, and 27.

Similarly, nothing in Marchetti *et al.* taken alone or taken in combination with Banks would have suggested a method for making a complex structure that includes the steps of the structure is made by forming a first electrode on the substrate, forming a carbonaceous thin film *on the surface of the first electrode*, forming a fullerene polymer film on the thus formed carbonaceous thin film, and then forming a second electrode on the thus formed fullerene polymer film, as recited in claims 25 and 26. As discussed above, Marchetti *et al.* describe *electrodes* for fuel cells comprised of three layers: a carbon substrate layer 30, a fullerene anchor layer 36, and a platinum catalyst layer 37. Nothing in Marchetti et al., whether considered alone whether considered together with Banks, would have suggest a complex structure in which a carbonaceous thin film is formed *on* a first electrode, then a fullerene polymer film is formed on the thus formed carbonaceous thin film, and then a second electrode is formed the thus formed fullerene polymer. Therefore, nothing in the references relied upon by the examiner would have made obvious the method recited in claims 25 and 26.

CONCLUSION

In light of the foregoing amendments and remarks, it is believed that the application is in condition for allowance, so that a prompt and favorable action is earnestly solicited.

Respectfully submitted,

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May 12, 2003 Elena Parise
Date Elena Parise

Version with Marking Showing Changes Made

In the Claims

Claims 12, 17, and 21 have been amended as follows:

12. (twice amended) A method for manufacturing a carbonaceous complex structure comprising:

a step of forming a carbonaceous thin film on a smooth surface of a substrate and

a step of forming a fullerene [thin] polymer film on said thus formed carbonaceous thin film.

17. (twice amended) The method for manufacturing a carbonaceous complex structure according to claim 12 further comprising the step of

layering a pair of spaced apart electrodes on said carbonaceous thin film such that said fullerene [thin] polymer film is formed at least in the space between said electrodes.

21. (twice amended) The method for manufacturing a carbonaceous complex structure according to claim 12 wherein

said fullerene [thin] polymer film is formed by vapor deposition of fullerene molecules to form a vapor-deposited film and then illuminating said film of fullerene molecules by electromagnetic waves to polymerize said fullerene molecules.